



XPC gene

XPC complex subunit, DNA damage recognition and repair factor

Normal Function

The *XPC* gene provides instructions for making a protein that is involved in repairing damaged DNA. DNA can be damaged by ultraviolet (UV) rays from the sun and by toxic chemicals, radiation, and unstable molecules called free radicals.

DNA damage occurs frequently, but normal cells are usually able to fix it before it can cause problems. One of the major mechanisms that cells use to fix DNA is known as nucleotide excision repair (NER). The XPC protein starts this repair process by detecting DNA damage. Then a group (complex) of other proteins unwind the section of DNA where the damage has occurred, snip out (excise) the abnormal section, and replace the damaged area with the correct DNA.

Studies suggest that the XPC protein may have additional roles in DNA repair and in other cell activities. Less is known about these proposed functions of the XPC protein.

Health Conditions Related to Genetic Changes

xeroderma pigmentosum

More than 40 mutations in the *XPC* gene have been found to cause xeroderma pigmentosum. Mutations in this gene are the most common cause of this disorder in the United States and Europe.

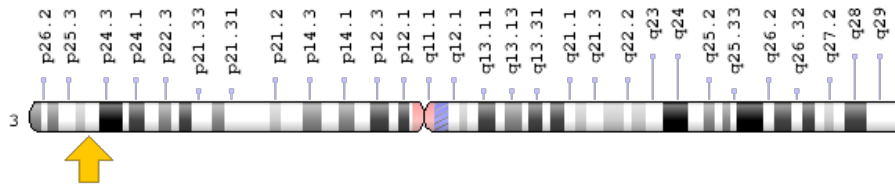
Most *XPC* gene mutations prevent the production of any XPC protein. A loss of this protein keeps cells from repairing DNA damage normally. As a result, abnormalities accumulate in DNA, causing cells to malfunction and eventually to become cancerous or die. These problems with DNA repair cause people with xeroderma pigmentosum to be extremely sensitive to UV rays from sunlight. When UV rays damage genes that control cell growth and division, cells can grow too fast and in an uncontrolled way. As a result, people with xeroderma pigmentosum have a greatly increased risk of developing cancer. These cancers occur most frequently in areas of the body that are exposed to the sun, such as the skin and eyes.

Unlike some of the other forms of xeroderma pigmentosum, when the disorder is caused by mutations in the *XPC* gene it is generally not associated with neurological abnormalities (such as delayed development and hearing loss). It is unclear why some people with xeroderma pigmentosum develop neurological abnormalities and others do not.

Chromosomal Location

Cytogenetic Location: 3p25.1, which is the short (p) arm of chromosome 3 at position 25.1

Molecular Location: base pairs 14,145,147 to 14,178,672 on chromosome 3 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- RAD4
- Xeroderma pigmentosum group C-complementing protein
- xeroderma pigmentosum, complementation group C
- XP3
- XPC_HUMAN
- XPCC

Additional Information & Resources

Educational Resources

- Cancer Medicine (sixth edition, 2003): Steps in Nucleotide Excision Repair (image) <https://www.ncbi.nlm.nih.gov/books/NBK13017/?rendertype=figure&id=A5537>
- Molecular Biology of the Cell (fourth edition, 2002): DNA Repair <https://www.ncbi.nlm.nih.gov/books/NBK26879/>
- Xeroderma Pigmentosum Society, Inc.: DNA Repair Explained in Simple Terms <https://www.xps.org/single-post/2015/04/08/DNA-Repair-Explained-in-Simple-Terms>

GeneReviews

- Xeroderma Pigmentosum <https://www.ncbi.nlm.nih.gov/books/NBK1397>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28XPC%5BTI%5D%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D>

OMIM

- XPC GENE
<http://omim.org/entry/613208>

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
<http://atlasgeneticsoncology.org/Genes/XPCID122.html>
- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=XPC%5Bgene%5D>
- HGNC Gene Family: Xeroderma pigmentosum complementation groups
<http://www.genenames.org/cgi-bin/genefamilies/set/1125>
- HGNC Gene Symbol Report
http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=12816
- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/7508>
- UniProt
<http://www.uniprot.org/uniprot/Q01831>

Sources for This Summary

- Bernardes de Jesus BM, Bjørås M, Coin F, Egly JM. Dissection of the molecular defects caused by pathogenic mutations in the DNA repair factor XPC. *Mol Cell Biol.* 2008 Dec;28(23):7225-35. doi: 10.1128/MCB.00781-08. Epub 2008 Sep 22.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18809580>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2593387/>
- Chavanne F, Broughton BC, Pietra D, Nardo T, Browitt A, Lehmann AR, Stefanini M. Mutations in the XPC gene in families with xeroderma pigmentosum and consequences at the cell, protein, and transcript levels. *Cancer Res.* 2000 Apr 1;60(7):1974-82.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/10766188>
- Cleaver JE, Thompson LH, Richardson AS, States JC. A summary of mutations in the UV-sensitive disorders: xeroderma pigmentosum, Cockayne syndrome, and trichothiodystrophy. *Hum Mutat.* 1999;14(1):9-22. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/10447254>

- D'Errico M, Parlanti E, Teson M, de Jesus BM, Degan P, Calcagnile A, Jaruga P, Bjørås M, Crescenzi M, Pedrini AM, Egly JM, Zambruno G, Stefanini M, Dizdaroglu M, Dogliotti E. New functions of XPC in the protection of human skin cells from oxidative damage. *EMBO J*. 2006 Sep 20;25(18):4305-15. Epub 2006 Sep 7.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16957781>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1570445/>
- Hoogstraten D, Bergink S, Ng JM, Verbiest VH, Luijsterburg MS, Geverts B, Raams A, Dinant C, Hoeijmakers JH, Vermeulen W, Houtsmuller AB. Versatile DNA damage detection by the global genome nucleotide excision repair protein XPC. *J Cell Sci*. 2008 Sep 1;121(Pt 17):2850-9. doi: 10.1242/jcs.031708. Epub 2008 Aug 5. Erratum in: *J Cell Sci*. 2008 Dec 1;121(Pt 23):3991. Ng, Jessica M Y [added]. *J Cell Sci*. 2008 Sep 1;121(Pt 17):2972.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18682493>
- Khan SG, Oh KS, Shahnavi T, Ueda T, Busch DB, Inui H, Emmert S, Imoto K, Muniz-Medina V, Baker CC, DiGiovanna JJ, Schmidt D, Khadavi A, Metin A, Gozukara E, Slor H, Sarasin A, Kraemer KH. Reduced XPC DNA repair gene mRNA levels in clinically normal parents of xeroderma pigmentosum patients. *Carcinogenesis*. 2006 Jan;27(1):84-94. Epub 2005 Aug 4.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16081512>
- Sugasawa K. UV-induced ubiquitylation of XPC complex, the UV-DDB-ubiquitin ligase complex, and DNA repair. *J Mol Histol*. 2006 Sep;37(5-7):189-202. Epub 2006 Jul 21. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16858626>
- Sugasawa K. XPC: its product and biological roles. *Adv Exp Med Biol*. 2008;637:47-56. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/19181110>

Reprinted from Genetics Home Reference:
<https://ghr.nlm.nih.gov/gene/XPC>

Reviewed: May 2010
Published: March 21, 2017

Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services